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ABSTRACT

Four research papers on the evaluation of the Utah State Department of Employment Security's (USES's) General Aptitude Test Battery (GATB) for the deaf are presented. The studies were conducted by the test research staff of the Employment Security Commission of North Carolina from 1970 to 1979. The studies contain not only the analyses on which the GATB for the Deaf in based, but discussions of the issues that prompted the studies and the chronology of steps taken to resolve these issues. Report titles include: (1) "The Development of GATB Administration Procedures for the Deaf"; (2) "Technical Report on the Development of Revised GATB Instructions for the Deaf"; (3) "Technical Report on Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery, July 1971"; and (4) "Technical Report on Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery, Study II November 1972." The GATB appears to be more valid for deaf examinees than does the Nonreading Aptitude Test Battery. The study reports recommend the use of trained interpreters in administration of the GATB to deaf individuals. While this method is somewhat superior, a more practical method of testing for most job service agencies involves the individual administration by staff not necessarily trained in manual communication. (TJH)

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USES TEST RESEARCH REPORT NO. 41

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Summary and Compendium of Studies on the Development of the USES General Aptitude Test Battery for the Deaf

Western Test Development Field Center

Salt Lake City, Utah

TM 013853

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Foreword

The studies in this report were conducted by the test research staff of the Employment Security Commission of North Carolina from 1970 to 1979. The cooperation of other State agencies is acknowledged in their 1979 report.

These reports contain not only the analyses on which the GATB for the Deaf is based, but discussion of the issues which prompted the studies and the chronology of steps taken to resolve these issues. The deep background exploration of the problems and abilities of deaf individuals provided the needed information for a practical approach to the administration and interpretation of the GATB for the Deaf.

The reports recommend the use of trained interpretors in administration of the GATB to deaf individuals. While this method is somewhat superior because of enhanced communication, a suitable and more practical method of testing for most Job Service agencies is the individual administration by staff not trained in manual communication.

The current philosophly of testing handicapped leans toward giving tests to as many handicapped individuals as possible, in spite of the possibility of frustration and a failure experience. Individual choice by the applicant and the potential value of the tests in placing hard-to-place individuals should weigh heavily in the decision whether to test. No individual should automatical ly be excluded from testing because of relatively higher probability of failure indicated by data in these studies.

INTRODUCTION

Test instruments constructed for, and standardized on, a hearing population do not accurately assess those characteristics and attributes for which they were designed when used with the deaf. This is due to a number of factors, but principally to the low level of language competency of the majority of deaf persons. In view of this problem, procedures must be incorporated into testing which will increase the ability to obtain valid measurements for deaf applicants. This is especially important for aptitude testing. The deaf traditionally have been placed in society's most menial jobs - jobs requiring basically manual aptitudes. Information concerning the presence of other aptitudes should encourage employers to consider the deaf for jobs requiring other abilities. In this sense the information should be of considerable benefit to agencies serving the deaf.

During the 1970's the Southern Test Development Field Center conducted a series of studies to determine the most valid method of measuring aptitudes among the deaf. These studies were conducted with the USES developed tests, the General Aptitude Test Battery (GATB) and the Nonreading Aptitude Test Battery (NATB). They were prompted by the low scores obtained by deaf students at the North Carolina School for the Deaf and by Job Service local office applicants on the verbally oriented tests. Their scores for Aptitudes G (Intelligence), V (Verbal), and N (Numerical) were significantly lower than the hearing population. It was hypothesized that a combination of the following factors affected the scores:

(1) The possibility that the GATB is not a valid test for the deaf

(2) The low level of language development among the deaf

(3) The language level of the test instructions

(4) The lack of a formal, standardized method of administering the GATB to the deaf

(5) The practice of testing persons with special test taking problems in groups

This report contains summaries of the research findings for each of the studies. The summaries provide a quick view of each study for those interested in a general explanation of the research. Following the summaries are the technical reports of each study. They provide a full explanation of the research for those interested in an in-depth study of the findings.

STUDY SUMMARIES*

Technical Report on Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery June, 1971

Purpose: (1) To compare the performances of deaf high school students on aptitudes G, V, and N of the GATB and NATB, (2) To compare GATB scores of deaf sample members with non-deaf sample members, (3) To compare GATB scores of the congenitally and non-congenitally deaf, and (4) To compare the GATB scores of male and female deaf students.

Results: The deaf students scored higher with the GATB for aptitudes G, V, and N than with the NATB. The non-deaf sample scores for G, V, and F were higher than for the deaf, and the deaf students scored higher on aptitudes S, P, Q, and M. For aptitude N there was no significant difference between the groups. When the deaf and the non-deaf were given the NATB parts which measured aptitudes G, V, and N, the deaf scored lower for all three aptitudes. Age of onset of deafness made little difference when comparing NATB and GATB scores. Both the congenitally and non-congenitally deaf scored higher with the GATB for aptitudes G and V. However, any comparison of information between the congenitally and non-congenitally deaf should be interpreted cautiously. Due to the difficulties of detecting deafness in very young children and in determining the causes of deafness, records regarding age of onset of deafness may not be reliable. Male/female score comparisions were consistent with findings in the general population (GATB Manual Section III, Development). The male students scored slightly higher on aptitude S, and the female students scored higher on aptitudes P, Q, and K.

Conclusions: The GATB appears to be more valid for the deaf than the NATB. The test administrators noted that while the NATB is nonreading, it is not nonverbal. The instructions for administration are perhaps more verbal than the GATB. The higher deaf scores for aptitudes S, P, and Q should have important implications for counseling and job placement.

Technical Report on Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery, Study II, November, 1972

Purpose: (1) To compare the performances of deaf high school students on aptitudes G, V, and N as measured by the GATB with their performance on aptitudes G, V, and N as measured by the NATB, (2) To compare the performance of congenitally and non-congenitally deaf students on the GATB and the NATB, (3) To examine sex differences in the level of GATB aptitude scores for deaf students and, (4) To compare the results of the initial study (June, 1971), Sample I, with the results of this study, Sample II.

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*Differences in test scores being compared will only be noted when they are at the .05 level of significance or greater.

Results: A comparison of GATB and NATB scores shows that the findings of this study are consistent with the initial study. The deaf scored higher with the GATB -- slightly higher for aptitudes G and N and significantly higher for V. The findings were also consistent with the initial study in comparing all GATB scores of the deaf students with a nondeaf group. The nondeaf scored higher for G, V, and N and the deaf scored the same or higher on S, P, and Q. The GATB scores for the congenitally and non-congenitally deaf were compared, and the S scores for the former group were higher. Unlike the first study, this study revealed no significant differences between the scores of male and female deaf students. A comparison of the GATB scores for the two studies showed that the Sample I scores were higher for aptitudes G, V, N, Q, and M.

Conclusions: Analysis of this data supports the conclusions of the first study. The GATB seems more appropriate for the deaf than the NATB. The score differences between the two samples may be due to changing capabilities from one high school class to the next.

Technical Report on the Development of Revised GATB Instructions for the Deaf, January, 1973

Purpose: (1) To establish a standardized method of administering the GATB to the deaf by revising the administration instructions, and (2) To compare sign language testing in groups with revised written instructions testing individually.

Revision of the administration instructions: The standard GATB instructions were revised to be presented in written form. The language level was reduced to a suitable level for the deaf without formal sign interpretation. The revised instructions contain few word concepts higher than the third grade level. The sentence structure was changed, and certain words and sentences were deleted. The new instructions were presented to the examinees on 4" x 6" cards. When a double asterisk (**) appeared on a card, the examinee was told to look to the administrator who pointed out appropriate aspects of the test. Notes were written when further explanations were necessary. The method of administering the tests for aptitude F was changed to simplify the reasoning process. Part 11, Assemble, was demonstrated, practiced, and administered; then, Part 12, Disassemble, was demonstrated, practiced, and administered.

Results: Although sign language communication with the deaf is preferable to written communication, factors discussed in the technical report for this study prohibited the development of a sign language administration system. The hypothesis of this study was that deaf examinees tested individually with the revised written instructions would produce scores comparable to deaf examinees tested in a group with a sign language administration. The hypothesis was supported.

Conclusions: The comparability of scores for the two methods showed that the language level of the instructions on the cards was appropriate for the deaf. The advantage of individual testing seems to have neutralized the advantage of sign language communication. The changed method of administering Parts 11 and 12 produced scores for aptitude F much closer to those of the general population

than the traditional administration. Although sign language administration to individuals may be preferred, the revised written instructions can be used where infrequent usage is expected and where there are no qualified manual communicators who are familiar with the psychology of deafness and psychological test administration (See Technical Report).

Technical Report on the Development of GATB Administration Procedures for the Deaf, 1979

Purpose: The 1973 study GATB administration instructions written on 4" x 6" cards were submitted to experts in testing and the psychology of deafness for their evaluations. As a result they were revised to eliminate redundant phrases and unnecessary pauses to point out information. The purpose of this study was: (1) To examine the effectiveness of the revised card method of GATB administration, (2) To compare GATB scores obtained with the revised cards with GATB scores from the previous deaf studies, with GATB scores for the general population, and with other measures of abilities for the deaf obtained from school records, and (3) To obtain the reactions of deaf students to the card method.

Results: Aptitude means for four deaf studies were compared by t-tests. The scores were found to be relatively stable with only 4 of 54 t-tests indicating significant differences. The means confirmed the pattern of low scores of the deaf on the verbally oriented cognitive aptitudes G, V, and N when compared to the general population. The aptitude scores of the 1979 sample were correlated with IQ and Stanford Achievement Test scores. The correlations were high, ranging on aptitudes G, V, N, and S from .41 to .86. Since the administration method for the Stanford Achievement Test was specifically designed for and validated on the deaf, this supports construct validity for the use of the GATB with the deaf. As expected a number of deaf students expressed difficulty with the parts of the GATB which measure aptitudes V and N, but 75% indicated the administration instructions were understandable. Sixty-six percent felt they would have done better if the examiner had known sign language. Research including a control group with examiners using sign language to help solve practice exercise problems should be conducted to explore this.

Conclusions: The revised card method is a practical approach to provide standard administration of the GATB to the deaf. There are also implications for an expanded use of aptitude S scores. All four samples have aptitude S means slightly lower than the general population. However, the stability of the S means across all samples suggests that this may be the best reference for counselors as to general learning ability for the deaf. This is warranted by the significant projection of the G factor in the Part 3, Three Dimensional Space test which measures S (GATB Manual, Section III: Development, pg. 9).

Discussion of the Card Method in Its Final Form

Due to the success of the revised cards used for the 1979 study, they were reviewed for a final revision. It was discovered that taking out all remaining double asterisks requiring the deaf to pause while reading for assistance would increase the total number of cards only slightly. The asterisks were removed

to simplify the procedure. The administrator will now wait until the examinee has finished reading one specific instruction or statement to point out appropriate aspects of the test.

THE DEVELOPMENT OF GATB ADMINISTRATION PROCEDURES FOR THE DEAF

Southern Test Development Field Center
Raleigh, North Carolina

U.S. DEPARTMENT OF LABOR

Employment and Training Administration
United States Employment Service

1979

Introduction

The United States Department of Labor has conducted a number of studies concerning the validity of the General Aptitude Test Battery when used with the deaf population. The research has been concentrated in three areas: (1) Comparing GATB scores of the deaf with those of the general population. (2) Comparing GATB and NATB scores of the deaf. (3) Improving and standardizing test administration procedures for the deaf.

Studies of deaf samples have demonstrated that their GATB aptitude scores approximate the general population scores except for the verbally oriented aptitudes, General Intelligence, Verbal, Numerical (G, V, and N). These studies indicate that the GATB could be used for the deaf with reservations. With the development of the Nonreading Aptitude Test Battery (NATB), a study was conducted to compare GATB scores with NATB scores for the deaf on aptitudes G, V, and N[1]. The results of this study showed GATB scores to be significantly higher than NATB scores. A check study also produced GATB scores for G, V, and N higher than the same NATB scores, but only the mean V score was significantly higher.[2] This indicated the NATB should not be used as a substitute for GATB, G, V, and N aptitude scores for the deaf.

Since the GATB was indicated as the better test for the deaf, research turned toward developing a simplified, standardized method of GATB administration that could be applied in many situations. A sign language administration was considered, but several serious problems were encountered, e.g., lack of uniformity of sign language, levels of sign language competency among the deaf, and the limited number of skilled sign language communicators. Due to these problems, an individual administration method with the instructions written on 4" x 6" index cards seemed preferable. The reading level on the cards was reduced to the lowest possible level. With this method the cards are read by the examinees at their individual reading rates and the administrator points out facets of the test when a double asterisk appears on the cards. A note pad is provided for questions and answers.

In the first two studies the GATB was administered using a sign language communicator to interpret while a trained test administrator read the standard GATB instructions. A[3] study was conducted to compare the card method with the sign language method.[3] Two comparable samples were tested; one in a group with a sign communicator, the other by the individual card method. Tests showed no significant differences at the .05 level for the mean aptitude scores.

The card method and results of the study were sent to experts in the field to critique (Appendix 1). Their concensus was that the card method provided a more fair and equitable method of testing the deaf with the GATB. The main criticism was that the directions assumed the deaf were operating at a very low reading level. Several examiners commented that deaf students often became bored and impatient with the directions, and the pauses allowed to give demonstrations would be awkward

for examiners. As a result of these comments the instructions on the cards were revised to reduce the number of double asterisks. The original language level of the card method was retained. To determine the effects of these revisions, a sample was tested at the North Carolina School for the Deaf. The results are compared with data from the previous studies in this report.

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[1]Technical Report on Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery, Employment Security Commission of North Carolina, June, 1971.

[2]Technical Report on Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery - Study II, Employment Security Commission of North Carolina, November, 1972.

[3]Technical Report on Development of Revised GATB instructions for the Deaf, Employment Security Commission of North Carolina, January, 1973.

Purpose

The purpose of this study is: (1) To examine the effectiveness of the revised card method of GATB administration, and (2) To compare GATB scores obtained with this method with GATB scores from the previous deaf studies, with GATB scores for the general population, and with other measures of abilities for the deaf obtained from school records.

Samples

All samples compared in this study consisted of students at the North Carolina School for the Deaf in Morganton, North Carolina.

Sample I - 90 eleventh and twelfth grade students tested in September, 1971,[2] by the group sign language method of administration.

Sample II - 27 eleventh grade students tested in the fall of 1972,[3] by a group sign language method of administration.

Sample III - 28 eleventh grade students tested in the fall of 1972,[3] by the original card method.

Sample IV - 65 eleventh grade students tested in May, 1978, by the revised card method.

A descriptive profile of all samples is contained in Table I, Comparison of Deaf Samples. IQ scores were obtained with the Wechsler Intelligence Scale for Children, Wechsler Adult Intelligence Scale, Revised BETA, and the Hisley-Nebraska Test of Learning Aptitude.

TABLE I COMPARISON OF DEAF SAMPLES

	SAMPLE I		SAMPLE II		SAMPLE III		SAMPLE IV	
MALE	47		14		14		38	
FEMALE	43		13		14		27	
MINORITY	21		-		-		20	
NONMINORITY	63		-		-		45	
	M	SD	M	SD	M	SD	M	SD
AGE	19.3	1.2	18.3	1.0	18.3	1.2	18.7	.6
EDUCATION	11.4	.5	11.0	-	11.0	-	11.0	-
IQ	-	-	91.0	14.8	93.7	14.8	88.7	18.4
ACADEMIC AVERAGE	-	-	81.7	6.7	81.4	5.4	85.0	4.35
DEGREE OF DEAFNESS*								
PROFOUND	-		43				44	
SEVERE	-		10				17	
MODERATE	-		2				3	
ONSET OF DEAFNESS*								
CONGENITAL	54		50				40	
NON-CONGENITAL	22		2				10	
UNKNOWN	14		3				15	

*Figures for samples I and II combined in original data.

Degree of deafness is reported in terms of the following Pure Tone Scale of Decibal Loss:

Range of Decibal Loss	
80 + dB	Profoundly Deaf
60 - 79 dB	Severely Deaf
40 - 59 dB	Moderately Deaf
20 - 39 dB	Mildly Deaf

For this study GATB score comparisions were not made between the congenitally deaf and the non-congenitally deaf. Age-of-onset of deafness for Samples I and IV were impossible to determine due to the unknown causes of some deafness and the lack of documentation of age-of-onset.

Instruments and Methods

All twelve sub-tests of the GATB, B-1002, Form B, were administered to each sample to obtain scores on all nine GATB aptitudes:

G - General Learning Ability
V - Verbal Aptitude
N - Numerical Aptitude
S - Spatial Aptitude
P - Form Perception
Q - Clerical Perception
K - Motor Coordination
F - Finger Dexterity
M - Manual Dexterity

For Samples I and II the subjects were given the tests in a group setting. Standard GATB directions from the Manual for the USES, GATB, B-1002, Section I, were read to the students by a Test Development Analyst. These directions were simultaneously manually communicated to the students using formal sign language by a North Carolina School for the Deaf instructor. The students primarily received the instructions by lip reading the analyst or observing the formal signs. Those with partially impaired hearing listened to the analyst. Signals to begin and stop were given by dropping hands and flashing overhead lights respectively. Monitors who were not familiar with sign language communicated with students by writing notes on scratch paper during the practice exercise.

Samples III and IV were administered the test individually using the card method. Instructions were read by the subjects from 4" x 6" index cards in language suitable for the deaf. Sign language was not used. The language on the cards contained few word concepts higher than the third grade level. Sentence structure appropriate for the deaf was used, and certain words and sentences were deleted. A double asterisk (**) was printed on the cards to indicate when the students were to look at the examiner who pointed out various aspects of the test. Although some of the students could hear and speak, the test was administered without oral communication. Notes were written when further explanations were necessary during the practice exercises. Testing was begun by the examiner turning to the test questions and ended by placing a hand over the questions.

NATB cut-outs were used as an aid in demonstrating Part 3, Three Dimensional Space. Parts 11 and 12 were given separately. Part 11, Assemble, was demonstrated, practiced, and administered; then Part 12, Disassemble, was demonstrated, practiced, and administered. These changes were made to avoid confusion and overcome the lengthy verbal explanations needed for these parts for the deaf.

Card instructions for Sample IV were revised based on experience gained from Sample III and from critiques of the original card method. The changes consisted of removing redundant instructions and unnecessary double asterisks.

Results

Aptitude means, standard deviations, and t-tests were compared for the four samples (Table II). The aptitude scores were relatively stable from sample to sample with significant differences yielded by only 4 of the 54 t-tests. The following aptitude means were significantly different: (1) N between Samples II and IV, (2) K between Samples I and IV, (3) M between Samples I and IV, and (4) M between Samples III and IV. The means confirmed the pattern of low scores for the deaf on the verbal oriented cognitive aptitudes G, V, and N. The means and standard deviations for aptitude V were significantly lower than the general population. The means for aptitude G were expectedly low since GATB, Part 4, Vocabulary, contributes heavily to the G score. The significantly low N means can be attributed in part to the verbal makeup of Part 6, Arithmetic Reasoning.

All four samples have aptitude S means slightly lower than the general population while the means for aptitudes P and Q are slightly higher. The stability of the S mean across all samples suggests that this may be the best reference for the counselor as to general learning ability for the deaf. This is warranted by the significant projection of the G factor in the Part 3, Three Dimensional Space test which measures S (GATB Manual, Section III: Development, page 9). Using the original card method with Sample III produced higher K and M scores than using the group administration method with Samples I and II. However, testing Sample IV with the revised cards resulted in equal or lower means for K and M than Samples I, II, or III. The aptitude F scores for Samples I, II, and IV were low. A theory accounting for this has to do with multiple handicaps. The literature on deafness discusses the possibility that there may be a higher incidence of motor coordination problems for an identified, handicapped population, such as the deaf, than for the general population. Research is needed to examine this possibility.

TABLE II COMPARISON OF DEAF POPULATION GATB SAMPLES

Sample I	Nov. 1972	Group Method	N=90
Sample II	Jan. 1973	Group Method	N=27
Sample III	Jan. 1973	Individual Card Method	N=28
Sample IV	May 1978	Individual Card Method	N=65

APT.	N				MEANS				STANDARD DEVIATION				t-TESTS					
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I-II	I-III	I-IV	II-III	II-IV	III-IV
G	90	26	27	59	74.4	78.3	75.5	74.5	14.1	14.6	11.1	13.6	-1.25	-.42	-.01	.82	1.16	.33
V	90	27	27	63	75.3	75.7	74.8	74.0	6.6	7.8	7.9	5.6	-.21	.29	1.32	.43	1.07	.51
N	90	26	27	61	79.4	84.2	77.8	74.2	18.5	19.5	15.5	18.2	-1.12	.44	1.71	1.32	2.23*	.94
S	90	27	27	65	94.9	94.5	94.5	94.1	19.1	19.1	16.0	19.8	.21	.21	.25	.00	.08	.09
P	90	27	27	65	109.0	102.5	104.6	104.6	26.8	26.5	22.1	25.8	1.11	.86	1.03	-.32	-.35	.00
Q	90	27	27	64	104.7	101.6	105.3	102.5	17.8	18.0	20.3	22.3	.78	-.13	.67	-.71	-.18	.60
K	90	27	27	65	105.9	105.9	105.9	98.3	17.9	22.0	18.3	19.5	.00	.00	2.48*	.00	1.56	1.56
F	90	27	27	65	89.2	86.9	96.5	89.9	22.0	34.6	22.6	23.5	.32	-1.48	-.18	-1.20	-.40	1.46
M	90	27	27	65	99.9	96.4	101.5	89.8	21.5	38.9	22.8	21.7	.44	-.32	2.87**	-.58	.95	2.27*

*significant .05
**significant .01

A comparison of male/female and minority/nonminority subgroup scores for the 1978 sample was made. T-tests for the male/female mean scores showed no significant differences (Table III).

TABLE III

COMPARISON MALE/FEMALE 1978 SAMPLE

APT.	N		MEANS		STANDARD DEVIATIONS		RANGES		t-TESTS
	M	F	M	F	M	F	M	F	
G	36	23	75.7	72.7	14.7	11.8	56 109	57 95	.86
V	38	25	73.6	74.4	5.6	5.7	63 88	66 86	-.55
N	36	25	75.4	72.4	19.3	16.9	42 115	42 103	.64
S	38	27	96.9	90.1	21.7	16.3	55 133	68 124	1.44
P	38	27	104.3	105.1	21.8	31.0	53 143	47 161	-.11
Q	38	27	100.6	103.7	20.3	25.6	67 141	66 138	-.52
K	38	27	98.3	98.3	17.4	22.3	55 124	55 149	.00
F	38	27	89.5	94.1	20.3	24.8	49 132	32 135	-.79
M	38	27	92.9	85.4	21.2	22.2	48 135	32 119	1.36

The comparison of minority/nonminority scores showed Black students scoring significantly lower for all aptitudes except K. This suggests that even greater caution should be used in interpreting minority deaf GATB scores. The mean differences between Blacks and nonminorities for aptitudes G and N are approximately the same as those mean differences reported in Table 17-12 of the GATB Manual, Section III. However, the Sample IV mean difference for aptitude V is considerably less than the difference reported in Section III (Table IV).

TABLE IV

COMPARISON NONMINORITY/MINORITY 1978 SAMPLE

APT.	N		MEANS		STANDARD DEVIATIONS		RANGES		t Tests
	NON MIN.	MIN.	NON MIN.	MIN.	NON MIN.	MIN.	NON MIN.	MIN.	
G	42	16	78.9	63.8	13.0	8.4	57 109	51 84	5.2*
V	42	20	75.7	70.2	5.3	4.4	66 88	63 80	4.3*
N	44	16	79.4	60.8	17.6	12.5	42 115	42 82	4.7*
S	44	20	101.1	79.8	17.9	15.8	68 133	55 120	4.8*
P	44	20	112.7	87.8	24.4	20.6	50 161	47 135	4.2*
Q	44	20	110.2	85.4	19.6	18.2	68 141	66 122	4.9*
K	44	20	101.0	92.1	19.5	18.7	55 149	55 120	1.7
F	44	20	96.7	78.9	20.6	21.4	50 135	32 124	3.1*
M	44	20	93.3	81.1	20.8	21.9	32 135	40 114	2.1**

*significant at .05 level
**significant at .01 level

Intercorrelations of GATB aptitude scores for Samples III and IV data were compared with intercorrelations of the aptitude scores of subjects of occupational validation studies conducted between 1950 and 1966 (Table V). Correlations of aptitude S with aptitudes G, V, and N for the deaf were lower than those for the general populations. For the remaining aptitudes, the deaf intercorrelations were generally higher; however, the pattern was very similar to the general population. For Sample IV the manual aptitudes K, F, and M correlated higher with other GATB aptitudes than those for the general population, however, the same correlations for Sample III approximated those of the general population.

TABLE V

INTERCORRELATIONS OF GATB APTITUDES

SAMPLE IV 1978 DEAF SAMPLE N=65

APTITUDE	G	V	N	S	P	Q	K	F	M
G									
V	.57								
N	.86	.54							
S	.86	.39	.69						
P	.53	.48	.52	.58					
Q	.61	.53	.66	.59	.81				
K	.40	.30	.51	.42	.48	.61			
F	.47	.38	.43	.51	.74	.71	.58		
M	.43	.37	.42	.47	.62	.57	.62	.76	

SAMPLE III 1973 DEAF SAMPLE N=27

APTITUDE	G	V	N	S	P	Q	K	F	M
G									
V	.74								
N	.81	.58							
S	.70	.32	.42						
P	.51	.46	.52	.33					
Q	.76	.59	.85	.40	.72				
K	.29	.30	.53	.08	.55	.62			
F	.46	.43	.43	.23	.37	.47	.39		
M	.28	.15	.29	.19	.39	.39	.58	.60	

SUBJECTS OF OCCUPATIONAL VALIDATION STUDIES CONDUCTED
BETWEEN 1950 - 1966 N=23,428

APTITUDE	G	V	N	S	P	Q	K	F	M
G									
V	.84								
N	.86	.67							
S	.74	.46	.51						
P	.61	.47	.58	.59					
Q	.64	.62	.66	.39	.65				
K	.36	.37	.41	.20	.45	.51			
F	.25	.17	.24	.29	.42	.32	.37		
M	.19	.10	.21	.21	.37	.26	.46	.52	

The North Carolina School for the Deaf uses IQ, academic average, and the Stanford Achievement Tests for the Hearing Impaired to measure progress and to counsel their students. The school's records of these were available for Sample IV (Table VI).

TABLE VI MEANS OF SD's OF DEAF STUDENT MEASURES

MEASURES	MO	SD
IQ	88.7	18.4
Academic Average	85.0	4.35
Stanford Achievement Tests*		
Reading Comprehension	4.54	2.32
Math Conception	4.83	2.75
Math Computation	6.56	2.71
Math Application	4.49	3.06

*scores are in grade levels.

GATB scores for Sample IV were correlated with IQ scores and Stanford Achievement Test grades. They were not correlated with academic average. Since the students are grouped by ability and their school courses are not comparable, their academic averages are not comparable.

The Stanford Achievement Tests for the Deaf have been designed with simplified language, format, and sentence structure. The format requires administration by sign language proficient examiners. A comparison of GATB aptitude scores, IQ scores, and Stanford scores supports construct validity for the GATB when administered to the deaf by the revised card method. GATB aptitudes G, N, and S correlations with IQ were comparable to the Stanford - IQ correlations, all significant at the .01 level. Since Part 4, Vocabulary, is a verbal test and since 50 of the 65 IQ scores were WISC and WAIS Performance measures, the somewhat lower V - IQ correlation, .41 (.01), is reasonable. Further evidence of construct validity is the significant correlations between N and the three Stanford math measures.

Correlations between the aptitude scores and the Pure Tone Hearing Loss scores are also shown in Table VII. All correlations are negative with the exception of hearing loss and Q. The correlation between G and hearing loss is the only correlation significant at the .05 level.

TABLE VII CORRELATION OF GATB APTITUDES, STANFORD ACHIEVEMENT TESTS, AND IQ FOR SAMPLE IV

STANFORD ACHIEVEMENT FOR HEARING IMPAIRED	G	V	N	S	P	Q	K	F	M	IQ
READING COMPREHENSION	.59**	.59**	.70**	.54**	.43**	.49**	.42**	.30*	.23	.70**
MATHEMATICS CONCEPTS	.77**	.63**	.86**	.69**	.46**	.59**	.48**	.38**	.35**	.77**
MATHEMATICS COMPUTATION	.67**	.53**	.85**	.61**	.51**	.63**	.47**	.34**	.29*	.76**
MATHEMATICS APPLICATIONS	.77**	.60**	.77**	.67**	.39**	.50**	.36**	.31*	.23	.77**
IQ	.74**	.41**	.72**	.79**	.63**	.66**	.50**	.59**	.43**	1.00**
HEARING LOSS	-.28*	-.23	-.20	-.13	-.08	.02	-.13	-.11	-.20	-.06

* .05
** .01

Input From Examinees

In order to assess the reactions of the deaf students to the revised card method, a Post-Testing Questionnaire was given to each student (Table VIII).

Sixty-two percent expressed difficulty with the directions to Part 4, Vocabulary. This was expected because of low language development of the deaf. The examiners noted that many deaf students had little concept of synonyms and antonyms and were confused by the practice exercises.

The written problems of Part 6, Arithmetic Reasoning, were difficult for 32% which is expected of persons with impaired verbal development. This, in addition to the 28% who had difficulty with the Part 2, Arithmetic Computation directions, helps account for the depressed N scores. The other responses to questions indicate the directions were understandable to more than 75%. However, 66% of the students felt they would have done better if the examiner had known sign language. Research with a control group with examiners using sign language to help solve practice exercise problems should be conducted to explore this.

TABLE VIII

Deaf Study

Student Questionnaire

Name _____

1) Check any parts of the test that you had trouble understanding the directions.

11 Part 1 Name Comparison
18 Part 2 Arithmetic Computation
15 Part 3 Finding shapes made from pieces of paper
40 Part 4 Vocabulary
10 Part 5 Tool Matching
21 Part 6 Arithmetic Reason
7 Part 7 Form Matching
6 Part 8 Mark Making
4 Part 9 Placing Pegs
6 Part 10 Turning Pegs
9 Part 11 Assembling washers and rivets
11 Part 12 Disassembling washers and rivets

2) Did you think the directions were (check one)

8 Too easy and simple
27 Just right
23 Sometimes hard to understand
3 Always hard to understand

3) How did you feel about the ** (check one)

4 Not needed
4 Too many
13 A few could be left out
39 Just enough and helpful

4) Did you feel the method of directions

42 Helped you with the test
6 Confused you
11 Didn't matter
2 Bored you

5) Do you feel you could have done better if you had a person giving the test who knew sign language? Yes 43 No 18

6) Please make any other comments you would like about the test.

Conclusions and Recommendations

1. Sign language communicated by manual communicators is the most effective means of communicating with the deaf. In geographic areas where there is a heavy flow of deaf clients and the number of qualified interpreters, preferably members of Registry of Interpreters for the Deaf (RID), is sufficient, the test could be administered by interpreters. They should have completed the formal USTES training for GATB administration and should have studied the revised card method. They should be required to sign the instructions on the cards verbatim and observe all other standard GATB administration procedures. This may be done in a local office setting or according to each state's test release agreement requirements. In geographic areas with sparse deaf applicant flow or the absence of qualified interpreters, the revised card method should be used.

2. In Employment Service offices, counselors should administer the GATB by card method due to the importance of rapport.

3. The card method is an improvement over the haphazard practices of the past which violated standardization. However, obtained scores should still be carefully interpreted in counseling, especially for aptitudes G, V, and N. For these aptitudes, the strict interpretation of scores required for test selection is questionable and not advised.

4. The strict interpretation of scores for minority deaf applicants is not advisable.

5. Aptitude S should be investigated as a substitute measure of general learning ability for the deaf due to the projections of the G factor in the GATB test for S and the consistent performance of all deaf samples within .25 SD of the mean for the general population for aptitude S.

6. The use of a limited number of sign communications to assist Job Service counselors with the card method should be investigated, and if possible, built into the training for administration of the card method.

Appendix I - Reviewers of The Card Administration Method

1. Mr. Patrick Duggan, Counselor, Deaf Student Program, St. Paul Minnesota area Vocational Technical Institute

2. Ms. Mary Harlow, Department of Special Education, University of Minnesota

3. Dr. Donald Moores, Department of Special Education, University of Minnesota

4. Robert G. Sanderson, Educational Coordinator, Services to the Deaf, Division of Rehabilitation Services, Utah State Board of Education, Salt Lake City

5. Gene Stewart, Rehabilitation Counselor, Services to the Deaf, Division of Rehabilitation Services, Utah State Board of Education, Salt Lake City

6. Jim Hilber, Rehabilitation Counselor, Services to the Deaf, Division of Rehabilitation Services, Utah State Board of Education, Salt Lake City

7. C. O. Fingerle, Ph.D., Chief, Speech Pathology and Audiology, Division of Physical Medicine and Rehabilitation, College of Medicine, University of Utah, Salt Lake City, Utah

8. Donald C. Coffall, State Supervisor, Services to Handicapped, Older Workers, Veterans and Minorities, Utah Department of Employment Security, Salt Lake City, Utah

9. Mr. Alexander, Vocational Rehabilitation Counselor, School for the Deaf, Santa Fe, New Mexico

10. Dr. Thomas Dillon, Principal, School for the Deaf, Santa Fe, New Mexico

11. Marun Walach, Supervising Teacher, School for the Deaf, Santa Fe, New Mexico

12. Mr. Stanley R. Traxler, Director Special Education Program and Associate Dean, Seattle Central Community College

13. Mr. Steve King, Counselor for the Deaf, Seattle Central Community College

14. Mr. Truman Diot, Counselor for the Deaf, Seattle Central Community College

Appendix II - Basic Signs

Several reviewers and students suggested that an examiner unfamiliar with sign language could easily master a few basic signs pertinent to the administration. Where use of the method is infrequent, it would be difficult to retain familiarity with the signs, but where the test is given once or twice a month it should prove very helpful in enhancing rapport.

The following is a list of helpful signs:

same	good
different	add
begin	subtract
correct	multiply
perfect	divide
ready	opposite
always the same	work as fast as you can
sometimes the same	practice
example	

The following basic guide is available to teach examiners these signs:

Basic guides are available to teach administrators these signs. Talk With Your Hands by David O. Watson, Jr., Second Edition, June, 1979, $6.25, may be purchased in paperback from the author in Winneconne, Wisconsin, 54986 or from the George Banta Company, Menesha, Wisconsin, 54982. Other agencies which serve the deaf may offer short courses in manual communication.

TECHNICAL REPORT

ON

THE DEVELOPMENT OF REVISED GATB INSTRUCTIONS FOR THE DEAF

Employment Security Commission of North Carolina
Employment Service Division
Raleigh, North Carolina

January, 1973

THE DEVELOPMENT OF REVISED GATB INSTRUCTIONS FOR THE DEAF

INTRODUCTION

Test instruments constructed for, and standardized on, a hearing population do not accurately assess those characteristics and attributes for which they were designed when used with the deaf. This is due to a number of factors, but perhaps principally to the low level of language development of the majority of deaf persons. The extent of their impaired language development is determined by many factors among which are age at onset of impairment, handicaps in addition to hearing loss, type of school attended (residential, day classes, public school, specialized schools for the deaf), and personality characteristics.

BACKGROUND

A major problem involved in the counseling and placement of the deaf has been to obtain valid aptitude appraisals with the General Aptitude Test Battery. In many cases, the GATB has been administered on a trial and error basis, communicating with the deaf person in any way that could be devised. These scores were not only questionable but in most cases invalid due to the deaf person's difficulty in understanding written instructions. In other cases, the GATB was not administered to the deaf and no measure of aptitude was available. These factors led to a search for an improved, standardized method of administering the GATB to the deaf.

Although the deaf are often forced to express themselves and receive information in written form, most of them can communicate at a higher level of understanding by means of manual communication (sign language). For this reason a set of GATB administration instructions to be presented by manual communication was considered.

However, several factors influence the feasibility of administering the GATB in this manner. In the interest of obtaining the highest possible validity when measuring aptitudes of deaf applicants, authorities in this area suggest that administrators should be familiar with the psychology of deafness, test administration, and manual communication. The shortage of people with this combination of skills is critical. Less qualified manual communicators tend to interpret verbatim test instructions in their own manner, and the validity of test results is questionable.

Signs are interpretive, conceptual, and non-verbal in nature and synonymous words are frequently communicated by identical signs, e.g., big and large, amusing and funny. Moreover, the best way to communicate many concepts is in an indirect way. For example, "hot" and "warm" may best be conveyed by the sign for "summer". Since the difference between such terms would only be discernable in context, the signing of individual words for a test item would be confusing. Due to these factors, Part 4, Vocabulary, would have to be finger-spelled rather than signed and would be very time consuming.

It would also be impossible to communicate with all deaf persons using one set of signs because of the many levels of sign language competency among the deaf. Dr. McKay Vernon states that the manual communicator must sign to individuals according to their level of development in much the same way as one communicates with a hearing individual. Another factor prohibiting one standardized set of signs for nationwide use is the lack of unanimity among geographic areas. Each area or each group which maintains social contact for any length of time develops its own sign colloquialisms and uses them extensively.

Due to the above factors the regular GATB administration has been revised and can be administered to deaf applicants individually who have been screened and judged capable of taking the GATB. A trained local office test administrator can use the revised administration without manual communications. Because of the impaired language development of the deaf, the language of the revised instructions contains few word concepts higher than the third grade level. The sentence structure is more appropriate for the deaf, and certain words and sentences have been deleted. The instructions are presented to the applicant on 4" x 6" cards and various aspects of the test are pointed out to the examinee by the administrator throughout the test. This should provide uniformity of administration and eliminate the trial and error approaches.

PURPOSE

The purpose of the study is to establish a standardized method of GATB testing for the deaf by revising the regular administration instructions.

SAMPLE

The sample consisted of the junior class (N=55) at the North Carolina School for the Deaf in Morganton, North Carolina. The class was divided into two groups. Group I consisted of twenty-seven students tested in a group session by manual communication. All twenty-seven were included in the statistical analysis for all aptitudes except G and N. For aptitude G and N, twenty-six were in the sample since one person attained a zero raw score on Part 6 and was eliminated from the analysis for those aptitudes. Group II consisted of twenty-eight students tested individually with the revised instructions presented on 4" x 6" cards. Each student read the instructions and was assisted by an administrator. Twenty-seven were included in the sample. The student excluded was unable to cope with several of the subtests.

The two groups were matched according to the following factors:

1. Decibal loss of hearing
2. Age at onset of deafness
3. Sex
4. Age
5. Academic average
6. IQ scores
7. Paragraph meaning test scores
8. Word meaning test scores

Severity of deafness was reported using the Pure Tone Scale of Decibal Loss which follows:

Pure Tone Scale of Decibal Loss

Range of Decibal Loss	
80+	Profoundly deaf
60-80	Severely deaf
40-60	Moderately deaf
20-40	Mildly deaf

Forty-three of the students were profoundly deaf, ten severely deaf and two moderately deaf. Fifty of the students were either congenitally deaf or had become deaf prior to language development. Two students became deaf after language development (age three). Age at onset of deafness was unknown for three of the students.

Table I illustrates the distribution of students tested in the group and those tested individually by sex and hearing loss.

TABLE I

Distribution of Students Tested
in a Group and Those Tested Individually
Regarding Male-Female Ratio and Decibal Loss

Sex	GROUP I Sign Interpretation Method (group tested)	GROUP II Card Method (individually tested)
Male	14	14
Female	13	14
Deafness		
Profound	21	22
Severe	5	5
Moderate	1	1

The means, standard deviations, and t-ratios for academic performance, I.Q., Paragraph Meaning Scores and Chronological Age are reported in Table II.

TABLE II

	GROUP I Sign Interpretation Method (group tested)		GROUP II Card Method (individually tested)		
	M	SD	M	SD	t-ratio
Academic Avg.	81.74	6.66	81.40	5.40	.21
Paragraph Meaning	4.80	3.39	4.60	2.90	.24
I.Q.	91.00	14.82	93.70	14.80	.26
Age	18.28	.981	18.26	1.18	

I.Q. scores were either WISC or WAIS Performance Scores. The paragraph meaning scores were standard scores based on the Stanford Achievement Test reported in grade levels. The academic averages were the scores reported at the end of the tenth grade. The t-tests indicated no significant differences between these two groups at the .01 level on either of the variables.

INSTRUMENTS

All twelve sub-tests of the GATB, B-1002, Form A, were administered to the sample to obtain scores on all nine of the GATB aptitudes:

G - General Learning Ability
V - Verbal Aptitude
N - Numerical Aptitude
S - Spatial Aptitude
P - Form Perception
Q - Clerical Perception
K - Motor Coordination
F - Finger Dexterity
M - Manual Dexterity

COLLECTION OF DATA

Group I consisted of twenty-seven students who were given Parts 1-8 of the GATB in a group. Standard GATB directions from the Manual for the USES, GATB, B-1002, Section I, were read to the students by a Test Development Analyst. These directions were then manually communicated to the students with formal sign language by a North Carolina School for the Deaf instructor. The students exercised their preference and received the instructions by lip reading the analyst or observing the formal signs of the instructor. A small number sitting near the analyst, were able to hear the instructions. The signal to begin the test was given by the instructor dropping her hands. The signal to stop was given by flashing the overhead lights. Monitors who were unfamiliar with formal sign language communicated with the students by writing notes during the practice sections.

For administering Parts 9-12, Group I was divided into two groups. There was a test development analyst, an instructor who signed the directions, and a monitor for each group. The students first observed the test administrator demonstrate the Manual Communicator then related the specific instructions to the group by sign language. Flashing of the lights was the signal to begin and stop working for Parts 9-12. Parts 11 and 12 were connected according to the regular GATB administration.

Members of Group II read the instructions printed on fifty-nine 4" x 6" index cards in language suitable for the deaf without formal sign interpretation. When a double asterisk (**) appeared on the cards the students were instructed to look at the administrator who pointed out various aspects of the test. Although some of the students could hear as well as speak, the test was administered without verbal communication. Notes were written when further explanation was necessary during the practice exercises. Examinees were instructed to begin each sub-test as soon as the administrator turned to the test questions. The signal to stop working was given by the test administrator covering the test questions with his hand. Parts 11 and 12 were completely separated. Part 11, Assemble, was demonstrated, practiced and administered; then, Part 12, Disassemble, was demonstrated, practiced, and administered.

DATA ANALYSIS

Means and standard deviations were computed for all aptitudes of the GATB for both groups. T-tests were used to determine if significant differences existed.

TABLE III

Means, Standard Deviations, Ranges, and t-ratios for All Aptitudes of the GATB for Group I and Group II

	GROUP I Sign Interpretation Method (group tested)				GROUP II Card Method (individually tested)				
Aptitude	N	M	SD	Range	N	M	SD	Range	t
G	26	78.30	13.59	55-106	27	75.48	11.08	54-106	- .82
V	27	75.74	7.83	63-94	27	74.81	7.85	63-98	.43
N	26	84.15	19.50	47-115	27	77.77	15.53	54-119	1.32
S	27	94.48	19.09	68-153	27	94.48	15.95	65-133	.00
P	27	102.48	26.50	50-150	27	104.63	22.06	58-152	- .32
Q	27	101.62	17.97	67-134	27	105.33	20.34	74-151	- .71
K	27	105.92	21.95	33-132	27	105.93	18.32	76-140	.00
F	27	86.92	34.63	4-137	27	96.52	22.58	42-152	- 1.20
M	27	96.40	38.87	14-150	27	101.48	22.77	52-137	- .58

The mean scores for aptitudes G, V, and N are slightly higher for Group I than Group II. The mean scores for aptitudes S and K are the same for both groups. For aptitudes P, Q, F, and M the mean scores are slightly higher for Group II than Group I. The t-tests indicate no significant differences at the .05 level for any of the nine aptitudes between the two methods of testing. Although the t-test for the group means for aptitude F did not indicate a significant difference, the individually tested group scored much closer to the mean of 100 for the general population.

DISCUSSION

Authorities in the psychology of deafness encouraged a standardized manual communications administration of the GATB. They reasoned that since the deaf could understand test instructions better through manual communication, their scores would be higher and more valid than with written instructions. The hypothesis for this study was that subjects tested individually with written instructions would not score significantly different from subjects tested in a group with manual communication instructions. The t-tests in Table III support this hypothesis.

Since previous GATB research with the deaf found aptitude F scores significantly lower than for the general population, the proximity of the mean F score for those tested individually to that of the general population was gratifying. It is expected that the separation of Parts 11 and 12 contributed to this.

The practice of testing impaired subjects in groups is generally felt to be unsound. In practice the individual testing proved to be superior to group testing. Although the group session was monitored on a less than 1-10 ratio, there were occasions when providing assistance with practice exercises was extremely time consuming. It was apparent that several of the students in the group felt frustrated and emotionally upset because of their continuous need for assistance. On these occasions the adverse effects of group dynamics were brought into play.

Administration times for those tested individually varied, but the average time was estimated at 2 hours and 20 minutes per student as compared to 4½ hours to administer the GATB to the group using formal sign language.

The card method proved to be an easier method of presenting Parts 9-12 to the deaf. The procedure of explaining Part 11, Assembly, and completing that part before going to Part 12, Disassembly, also proved to be a better administration technique for the deaf person.

Although this research supports this method as a practical and efficient method of administering the GATB at the local office level for the majority of deaf people, additional research should be done on other deaf samples employing this card method.

RECOMMENDATIONS

It is recommended that qualified manual communicators, preferably members of RID (Registry of Interpreters for the Deaf), who are accustomed to working with the deaf be trained in GATB administration in areas where the caseload of deaf applicants and the number of qualified interpreters is sufficient. This method of administration could be released along with the GATB to other agencies and organizations working with the deaf.

The manual communicator would be required to sign the modified written card instructions verbatim. These instructions have been developed with revised sentence structure, simplified language, and excess wording deleted in accordance with the suggestions of authorities on communicating with the deaf. The frequency of applying this method of administration would have to be sufficient for the administrators to maintain competency.

Where no manual communicators are available it is recommended that a trained local office counselor or test administrator use the enclosed 4" x 6" cards with the modified written instructions. This would eliminate the problem of maintaining competency among administrators who infrequently use the method and the effect of turnover among personnel outside the Agency.

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Technical Report

on

Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery

Employment Security Commission of North Carolina
Employment Service Division
Raleigh, North Carolina

1972

APTITUDE SCORES OF DEAF HIGH SCHOOL STUDENTS ON THE GENERAL APTITUDE TEST BATTERY AND THE NONREADING APTITUDE TEST BATTERY STUDY II

INTRODUCTION:

For years the U. S. Employment Service has been testing deaf individuals with the General Aptitude Test Battery (GATB) for counseling and placement services. Various studies conducted by state employment agencies using the GATB reveal the same results, low mean scores and exceptionally low standard deviations for Aptitude V for the deaf when compared to the general population. Since the test for Aptitude V also contributes to the G score these low scores automatically depress the G scores for the deaf.

In 1968 the U. S. Employment Service completed research on the Nonreading Aptitude Test Battery (NATB) that was designed primarily for use with culturally and educationally disadvantaged people. The deaf population constitutes a culturally, and in many cases an educationally disadvantaged segment of our population. In June of 1971 the North Carolina State Employment Agency submitted a study on Aptitude Scores of Deaf High School Students on the General Aptitude Test Battery and the Nonreading Aptitude Test Battery. This study was performed to determine if the NATB were a more valid measure of Aptitudes G, V, and N for the deaf than the GATB.

The research design for this study is basically the same as the 1971 study. This provides an additional sample and a basis for comparison and further analysis.

PURPOSE:

The purpose of this study is: 1. To compare the performances of deaf high school students on Aptitudes G, V, and N as measured by the GATB with their performance as measured by the NATB; 2. To compare the performance of congenitally deaf students with noncongenitally deaf students on the GATB and NATB; 3. To examine sex differences in the level of GATB aptitude scores for deaf students, and; 4. To compare the results of the 1971 study, Sample I, with the results of this study, Sample II, to determine if the results are consistent.

METHOD:

Sample: All sample subjects were eleventh and twelfth grade students at the North Carolina School for the Deaf in Morganton, North Carolina. Ninety-four students were tested. Of these, four were eliminated due to incomplete test data. Of the final deaf sample in this study, forty-nine were eleventh grade students and forty-one were twelfth grade students. Fifty-four subjects were considered congenitally deaf and thirty-six noncongenitally deaf. Of the thirty-six included in the noncongenitally deaf sample there were fourteen cases in which the age of onset of deafness was unknown. Of the remaining twenty-two subjects the age of onset of deafness ranged from four months to five years.

For comparisons with a non-deaf group, means and standard deviations obtained on North Carolina High School Juniors and Seniors for the "Experimental Study on the Differences Among General Aptitude Test Battery Wooden and Plastic Manual Dexterity Apparatus" (N=540) were used for all GATB aptitudes. To compare a non-deaf, disadvantaged group with the deaf group for Aptitudes G, V, and N of the NATB, means and standard deviations of disadvantaged high school students as reported in

the USTES Nonreading Aptitude Test Battery Manual Section 2, Development, Chapter 3 were used. These non-deaf samples are the same ones used in the 1971 study. The following table shows the means, standard deviations, and ranges for age, education, and sex for the sample groups:

Means, Standard Deviations, and Ranges
for Age, Education, and Sex for Sample Groups

	N	Age Range	Age M	Age SD	Education M	Education SD	% Male	% Female
Sample I								
Congenitally Deaf	24	14-23	18.8	1.5	11.6	.5	46	54
Noncongenitally Deaf	35	17-21	18.7	1.5	11.5	.5	57	43
Total Deaf	59	14-23	18.8	1.5	11.6	.5	53	47
Sample II								
Congenitally Deaf	54	17-22	19.2	1.0	11.5	.5	46	54
Noncongenitally Deaf	36	17-23	19.4	1.4	11.4	.5	61	39
Total Deaf	90	17-23	19.3	1.2	11.4	.5	52	48
Disadvantaged Non-Deaf Sample	341	-----	17.5	.7	11.5	.5	48	52
N.C. High School Non-Deaf Sample	540	16-20	17.2	.6	11.4	.5	48	52

INSTRUMENTS:

1. All twelve subtests of the GATB, B1002A were administered to the entire sample to obtain a measure of the following aptitudes:

   G - General Learning Ability
   V - Verbal Aptitude
   N - Numerical Aptitude
   S - Spatial Aptitude
   P - Form Perception
   Q - Clerical Perception
   K - Motor Coordination
   F - Finger Dexterity
   M - Manual Dexterity

2. Since the only GATB versus NATB comparisons to be made were for Aptitudes G, V, and N only tests needed to measure these aptitudes by the NATB were administered. The following subtests of the NATB were administered:

   G - Matrices, Picture-Word Matching, and Oral Vocabulary
   V - Picture-Word Matching and Oral Vocabulary
   N - Coin Matching, Matrices, Oral Vocabulary, and Coin Series III

COLLECTION OF DATA:

Testing was conducted in September of 1971. Due to the nature of the students' handicap, test administration procedures for the GATB and NATB were altered. Directions were read to the students by a Test Development Analyst. These directions were then translated into sign language by a North Carolina School for the Deaf Instructor. On the Picture-Word portion of the NATB, the sign language interpreter

finger spelled the significant word in each statement. On the Oral Vocabulary portion of the NATB, the words were finger spelled and shown on flash cards with two-inch letters. The students were signaled to begin and to stop by flashing the overhead lights. Monitors who were not familiar with sign language communicated with students by writing notes on scratch paper during the practice exercises.

DATA ANALYSIS:

Means and standard deviations were computed for all aptitudes of the GATB and for G, V, and N of the NATB and for the following subgroups of the deaf sample:

1. congenitally deaf
2. noncongenitally deaf
3. male
4. female

The significance of mean differences between the groups were examined by t-tests in the following order:

1. NATB vs GATB for Deaf Sample
2. Deaf vs Non-deaf for GATB
3. Deaf vs Non-deaf for NATB
4. NATB vs GATB for Congenitally Deaf Sample
5. NATB vs GATB for Noncongenitally Deaf Sample
6. Congenitally Deaf vs Noncongenitally Deaf Sample for GATB
7. Congenitally Deaf vs Noncongenitally Deaf Sample for NATB
8. Male Sample vs Female Sample for GATB
9. Male Sample vs Female Sample for NATB
10. Deaf Sample I vs Deaf Sample II for GATB
11. Deaf Sample I vs Deaf Sample II for NATB

RESULTS:

Table I shows the means, standard deviations, Pearson Product-Moment Correlations, and t-ratios for Aptitudes G, V, and N of the NATB as compared to the same aptitudes as measured by the GATB for the sample of deaf high school students. The mean score on Aptitude V of the GATB is significantly higher than the mean score of V on the NATB.

TABLE I

Means, Standard Deviations, Pearson Product-Moment Correlations, and t-ratios of Aptitudes G, V, & N of the NATB and GATB for Deaf Sample II

		NATB		GATB			
Aptitude	N	M	SD	M	SD	r	t
G	90	71.3	14.3	74.4	14.1	.859	- 1.464
V	90	61.4	10.8	75.3	6.6	.591	-10.419**
N	90	77.8	17.0	79.4	18.5	.835	- .604

**.01 sig. level

In Table II the mean aptitude scores of Deaf Sample II are compared to the non-deaf high school students from North Carolina. The non-deaf sample scored

significantly higher than the deaf sample on Aptitudes G, V, and N. The deaf sample scored significantly higher on Aptitude P.

TABLE II

Means, Standard Deviations, and T-ratios of GATB Aptitudes for Deaf Sample II and Non-deaf Sample

GATB Aptitude	N.C. High School Non-deaf Sample N	M	SD	Deaf Sample II N	M	SD	t
G	533	91.5	14.4	90	74.4	14.1	10.610**
V	540	90.6	12.2	90	75.3	6.6	17.556**
N	534	94.5	15.5	90	79.4	18.5	7.323**
S	539	93.8	18.3	90	94.9	19.1	- .509
P	534	101.8	17.3	90	109.0	26.8	2.464*
Q	540	103.9	13.2	90	104.7	17.8	- .406
K	531	102.9	16.3	90	105.9	17.9	- 1.489
F	538	92.5	18.3	90	89.2	22.0	1.347
M	540	102.2	17.9	90	99.9	21.5	.961

**.01 sig. level
*.05 sig. level

Table III shows the means, standard deviations, and t-ratios of the NATB aptitudes for Samples I and II of deaf high school students and non-deaf disadvantaged high school students. The non-deaf sample scored significantly higher than the deaf samples on Aptitudes G, V, and N of the NATB.

TABLE III

Means, Standard Deviations, and t-ratios of NATB Aptitudes for Sample I of Deaf High School Students and Non-deaf, Disadvantaged High School Students

NATB Aptitude	Disadvantaged Non-deaf Sample N	M	SD	Deaf Sample I N	M	SD	t
G	341	94.7	17.8	59	75.6	15.1	8.76**
V	341	92.4	16.0	59	64.9	12.0	15.45**
N	341	102.9	15.6	59	86.3	18.4	6.56**

**.01 sig. level

Means, Standard Deviations, and t-ratios of NATB Aptitudes for Sample II of Deaf High School Students and Non-deaf, Disadvantaged High School Students

NATB Aptitude	Disadvantaged Non-deaf Sample N	M	SD	Deaf Sample II N	M	SD	t
G	341	94.7	17.8	90	71.3	14.3	13.079**
V	341	92.4	16.0	90	61.4	10.8	21.671**
N	341	102.9	15.6	90	77.8	17.0	12.670**

**.01 sig. level

Table IV shows the means, standard deviations, Pearson Product-Moment Correlations and t-ratios of Aptitudes G, V, and N of the NATB and GATB for the sample of congenitally deaf high school students. The sample scored significantly higher on the GATB than the NATB on Aptitude V. The difference on Aptitudes G and N are not significant.

TABLE IV

Means, Standard Deviations, Pearson Product-Moment Correlations, and t-ratios of Aptitudes G, V, and N of the NATB and GATB for Congenitally Deaf

		NATB		GATB			
Aptitude	N	M	SD	M	SD	r	t
G	54	71.9	14.2	75.2	14.3	.874	-1.203
V	54	61.0	10.1	75.1	6.4	.581	-8.666**
N	54	78.2	18.3	79.3	19.2	.847	- .305

**.01 sig. level

Table V shows the means, standard deviations, Pearson Product-Moment Correlations, and t-ratios of Aptitudes G, V, and N of the NATB and GATB for the sample of noncongenitally deaf high school students. The sample scored significantly higher on Aptitude V of the GATB than the NATB.

TABLE V

Means, Standard Deviations, Pearson Product-Moment Correlations, and t-ratios of Aptitudes G, V, & N of the NATB and GATB for Noncongenitally Deaf

		NATB		GATB			
Aptitude	N	M	SD	M	SD	r	t
G	36	70.4	14.4	73.1	13.7	.838	- .815
V	36	62.1	11.8	75.6	6.9	.599	-5.926**
N	36	77.2	14.8	79.4	17.4	.814	- .578

**.01 sig. level

Table VI shows the means, standard deviations, and t-ratios of GATB scores for the congenitally deaf sample and the noncongenitally deaf sample. The congenitally deaf scored slightly higher on Aptitudes G, P, Q, K and F. The only significant difference was Aptitude S. The noncongenitally deaf scored slightly higher on Aptitude V, N, and M.

TABLE VI

Means, Standard Deviations, and t-ratios of GATB Aptitude Scores for Congenitally Deaf and Noncongenitally Deaf in Sample II

GATB Aptitude	Congenital Sample N	M	SD	Noncongenital Sample N	M	SD	t
G	54	75.2	14.3	36	73.1	13.7	.700
V	54	75.1	6.4	36	75.6	6.9	- .347
N	54	79.3	19.2	36	79.4	17.4	- .026
S	54	98.0	18.3	36	90.4	19.8	1.838*
P	54	109.8	26.0	36	106.1	26.5	.654
Q	54	105.0	16.9	36	104.4	19.4	.151
K	54	106.4	18.4	36	105.1	17.2	.342
F	54	90.5	23.1	36	87.3	20.3	.693
M	54	99.2	21.4	36	101.0	21.9	- .407

*.05 sig. level

Table VII shows the means, standard deviations, and t-ratios of NATB aptitude scores for the congenitally deaf and noncongenitally deaf high school students. The congenitally deaf students scored slightly higher on aptitudes G and N while the noncongenitally deaf scored slightly higher on V. However, none of the differences are significant.

TABLE VII

Means, Standard Deviations, and t-ratios of NATB Aptitude Scores for Congenitally Deaf and Noncongenitally Deaf High School Students - Deaf Sample II

NATB Aptitude	Congenital Sample N	M	SD	Noncongenital Sample N	M	SD	t
G	54	71.9	14.2	36	70.4	14.4	.487
V	54	61.0	10.1	36	62.1	11.8	-.458
N	54	78.3	18.3	36	77.2	14.8	.314

Table VIII shows the means, standard deviations, and t-ratios of GATB scores for males and females of Sample II. The males scored higher on Aptitudes G, N, S, and K. The females scored higher on Aptitudes V, P, Q, F, and M. However, none of these differences are significant.

TABLE VIII

Means, Standard Deviations, and t-ratios for Males and Females of Deaf Sample II on GATB Aptitudes

GATB Aptitudes	Males N	Males M	Males SD	Females N	Females M	Females SD	t
G	47	76.5	14.4	43	72.0	13.7	1.52
V	47	74.9	6.9	43	75.7	6.4	- .57
N	47	80.1	19.0	43	78.5	18.4	.40
S	47	97.9	20.3	43	91.6	17.4	1.58
P	47	107.9	22.6	43	110.8	31.8	- .49
Q	47	103.1	15.4	43	106.5	20.2	- .89
K	47	107.3	17.4	43	104.4	18.5	.76
F	47	85.6	20.2	43	93.1	23.4	-1.62
M	47	97.7	22.2	43	102.4	20.7	-1.16

Table IX shows the means and standard deviations and t-ratios of Aptitudes G, V, and N of the NATB for the male and female samples of deaf high school students. There is no significant difference in any of these mean scores.

TABLE IX

Means, Standard Deviations and t-ratios of Aptitudes G, V, and N of NATB for Males and Females in Sample II

NATB Aptitudes	Males N	Males M	Males SD	Females N	Females M	Females SD	t
G	47	71.6	15.4	43	71.1	13.3	.16
V	47	61.6	11.7	43	61.2	10.1	.17
N	47	78.7	16.8	43	76.8	17.4	.52

Table X shows the means and standard deviations of all aptitudes on the GATB for Sample I and Sample II. Sample I scored higher on all aptitudes except K and F. The differences on Aptitudes G, V, N, Q, and M are significant at the .01 level.

TABLE X

Means, Standard Deviations, and t-ratios of all Aptitudes of the GATB for Deaf Sample I and Deaf Sample II

GATB Aptitudes	Deaf Sample I N	Deaf Sample I M	Deaf Sample I SD	Deaf Sample II N	Deaf Sample II M	Deaf Sample II SD	t
G	59	85.1	15.4	90	74.4	14.1	4.288**
V	59	82.7	11.4	90	75.3	6.6	4.515**
N	59	90.7	16.4	90	79.4	18.5	3.908**
S	59	101.1	20.3	90	94.9	19.1	1.866
P	59	111.1	23.0	90	109.0	26.8	.510
Q	58	117.7	21.4	90	104.7	17.8	3.841**
K	59	105.6	18.6	90	105.9	17.9	- .098
F	58	83.6	24.1	90	89.2	22.0	-1.427
M	58	117.7	23.2	90	99.9	21.5	4.688**

**.01 sig. level

Table XI shows the means, standard deviations and t-ratios of Aptitudes G, V, and N of the NATB for Sample I and Sample II. Sample I scored higher than Sample II on all aptitudes; however, the only significant difference was for Aptitude V.

TABLE XI

Means, Standard Deviations, and t-ratios of
Aptitudes G, V, and N of the NATB for Deaf Sample I and Deaf Sample II

NATB Aptitude	Deaf Sample I N	M	SD	Deaf Sample II N	M	SD	t
G	59	75.6	15.1	90	71.3	14.3	1.736
V	59	64.9	12.0	90	61.4	10.8	1.811
N	59	86.3	18.4	90	77.8	17.0	2.841**

Table XII shows the means, standard deviations and t-ratios of all GATB aptitudes for the minorities and nonminorities in Sample II. It should be noted that the minority subsample is small and 1/3 the size of the nonminority subsample. The nonminority group scored significantly higher on all aptitudes except K.

TABLE XII

Means, Standard Deviations, and t-ratios of all Aptitudes of the GATB
for Minority and Nonminority Subgroups in Study II

GATB Aptitude	Nonminority N	M	SD	Minority N	M	SD	t
G	63	79.9	12.4	21	61.7	8.9	-7.302**
V	63	76.7	6.6	21	71.9	5.8	-3.170**
N	63	85.7	16.3	21	63.8	15.0	-5.668**
S	63	101.7	17.5	21	81.2	12.2	-5.930**
P	63	117.3	24.5	21	88.8	23.1	-4.822**
Q	63	110.3	16.1	21	92.2	13.6	-5.035**
K	63	107.9	18.5	21	101.2	17.0	-1.529
F	63	93.7	22.3	21	78.4	17.3	-3.251**
M	63	103.3	21.6	21	94.4	20.3	-1.712*

**.01 sig. level
*.05 sig. level

DISCUSSION:

In comparing Aptitudes G, V, and N of the GATB to Aptitudes G, V, and N of the NATB for Deaf Sample II, the results in this study are not as conclusive as the results in the 1971 study. T-tests computed for the 1971 study indicated significant differences at the .01 level for Aptitudes G, V, and N. In this study even though the scores on the GATB are higher the only difference that is significant is Aptitude V. (See Table I).

Table II shows that the non-deaf scored significantly higher than Deaf Sample II on Aptitudes G, V, and N. In the 1971 study the non-deaf scored significantly higher than the deaf on Aptitudes G, V, and F of the GATB. The differences for Aptitudes G and V are consistent in the two studies. The differences in Aptitudes F and N are not consistent and may be attributed to chance differences in the two samples.

The results in Table III are consistent with the results in the 1971 study. This indicates that the NATB may be a better measure of G, V, and N for the non-deaf disadvantaged for which it was designed, but not for the deaf.

Tables IV, V, and VII show comparisons of congenitally deaf and noncongenitally deaf. An attempt was made to pinpoint differences between congenitally and noncongenitally deaf high school students as to their performance on the GATB and the NATB. As in the 1971 study, noncongenital deafness is defined as deafness occurring any time after birth. According to psychologists working closely with the deaf, 30 to 36 months is the minimum time required for an individual to acquire speech patterns that are retained. Of the ninety subjects in this sample only five became deaf after age two and one-half years. Therefore, the results on the tables should be interpreted with caution as they may not represent truly congenital and noncongenital samples.

In this study the congenital group and the noncongenital group had higher mean scores on Aptitudes G, V, and N of the GATB than on the NATB; however, the overall differences were not as great as in the 1971 study. The only aptitude which has a significant difference is Aptitude V. In the 1971 study the mean scores for the noncongenital sample were significantly higher on all aptitudes of the GATB. The mean scores for the congenital sample were higher on Aptitudes G, V, and N of the GATB with significant differences on Aptitudes G and V.

In the 1971 study the comparison between males and females showed mean scores for all aptitudes of the GATB to be in agreement with previous studies of non-deaf samples. Females scored significantly higher on Aptitude K and slightly higher on all other aptitudes of the GATB except Aptitude S on which males scored slightly higher. In this study there are no significant differences between mean aptitude scores of males and females on the GATB. (See Table VIII).

In the 1971 study the females scored slightly higher than the males on Aptitudes G, V, and N of the NATB. However, none of the differences were significant. These results are consistent with the results in this study. (See Table IX).

Table X shows that Deaf Sample I scored significantly higher than Deaf Sample II on Aptitudes G, V, N, Q, and M of the GATB. Sample I scored higher than Sample II on Aptitudes G, V, and N of the NATB; however, none of these differences are significant.

There are some prominent differences in the 1971 study sample and the sample for this study which could explain the variances between the two studies. The number of minorities included in the 1971 sample is believed to be zero to three. In the present sample there were twenty-one Blacks in the sample of ninety. The mean scores of all aptitudes of the GATB are higher for the nonminority group than for the minority group in this sample. These differences range from 4.8 for Aptitude V to 28.5 for Aptitude P. These lower scores reduced the overall aptitude mean scores for the sample and may have affected the Sample I vs. Sample II comparisons.

TECHNICAL REPORT

ON

APTITUDE SCORES OF DEAF HIGH SCHOOL STUDENTS ON THE GENERAL APTITUDE TEST BATTERY AND THE NONREADING APTITUDE TEST BATTERY

Employment Security Commission of North Carolina
Employment Service Division
Raleigh, North Carolina
1971

APTITUDE SCORES OF DEAF HIGH SCHOOL STUDENTS ON THE GENERAL APTITUDE TEST BATTERY AND THE NONREADING APTITUDE TEST BATTERY

INTRODUCTION:

"The deaf population presents a unique situation in aptitude testing involving verbal material."[1] "Owing to their general retardation in linguistic development, deaf children are usually handicapped on verbal tests even when the verbal content is presented visually. (Anastasi, 1968, p. 265)."[2] For years the U.S. Employment Service has been testing deaf individuals with the General Aptitude Test Battery (GATB) for counseling and placement services. Various state employment agencies have conducted research using the GATB to measure aptitudes of the deaf. These studies unanimously reveal the same results, low mean scores and exceptionally low standard deviations for Aptitude V when compared to the general population. Since the test for Aptitude V also contributes to the G score, these low scores automatically depress the G scores for the deaf. There was concern for the validity of these scores for the deaf and the possibility that other tests might measure these aptitudes with more precision.

In 1968 the U.S. Employment Service completed research on the Nonreading Aptitude Test Battery (NATB) that was designed primarily for use with culturally and educationally disadvantaged people.

The deaf population constitutes a culturally and in many cases an educationally disadvantaged segment of our population. Although the NATB subtests contain verbal material, the test is administered orally to obtain a measure of Aptitude V. Since no previous studies of the deaf employed the NATB, the portions of that test which measure Aptitudes G, V, and N were used in this study to determine if it is a better instrument to measure those aptitudes of the deaf than GATB.

PURPOSE:

The purpose of this study is: (1) To compare the performances of deaf high school students on Aptitudes G, V, and N as measured by the GATB with their performance as measured by the NATB; (2) To compare the performance of the congenitally deaf students with the noncongenitally deaf students on the GATB and NATB, and; (3) To examine sex differences in the level of GATB aptitude scores for deaf students.

METHOD:

Sample: All sample subjects were eleventh and twelfth grade students at the North Carolina School for the Deaf in Morganton, North Carolina. Sixty-two students were tested. Of these, two were eliminated due to incomplete test data and a third because she suffered from cerebral palsy and test data was considered invalid. Of the final deaf sample twenty-six were eleventh grade students and thirty-three were twelfth grade students. Thirty-five subjects of the total sample were considered congenitally deaf and twenty-four were considered noncongenitally deaf. Noncongenitally deaf, defined for purposes of this study is deafness occurring anytime after birth.

For comparisons with a non-deaf group, means and standard deviations obtained on North Carolina High School Juniors and Seniors for the "Experimental Study on the Differences Among General Aptitude Test Battery Wooden and Plastic Manual Dexterity Apparatus" (N=540) were used for all aptitudes on the GATB. To compare

a non-deaf, disadvantaged group with the deaf group for Aptitudes G, V, and N of the NATB, means and standard deviations of disadvantaged high school students as reported in the USTES Nonreading Aptitude Test Battery Manual, Section 2, Development, Chapter 3, were used.

Means, Standard Deviations, and Ranges
for Age, Education, and Sex for Sample Groups

	N	Age			Education		%	%
		Range	M	SD	M	SD	Male	Female
Congenitally Deaf	24	14-23	18.8	1.5	11.6	.5	46	54
Noncongenitally Deaf	35	17-21	18.7	1.5	11.5	.5	57	43
Total Deaf	59	14-23	18.8	1.5	11.6	.5	53	47
Disadvantaged Non-deaf Sample	341	-----	17.5	.7	11.5	.5	48	52
N.C. High School Non-deaf Sample	540	16-20	17.2	.6	11.4	.5	48	52

INSTRUMENTS:

1. All twelve subjects of the GATB, B-1002A were administered to the entire sample to obtain a measure of the following aptitudes:

   G - General Learning Ability
   V - Verbal Aptitude
   N - Numerical Aptitude
   S - Spatial Aptitude
   P - Form Perception
   Q - Clerical Perception
   K - Motor Coordination
   F - Finger Dexterity
   M - Manual Dexterity

2. Since the only GATB versus NATB comparisons to be made were for Aptitudes G, V, and N, only tests needed to measure these aptitudes by the NATB were administered. The following subtests of the NATB were administered:

   G - Matrices, Picture-Word Matching, and Oral Vocabulary
   V - Picture-Word Matching and Oral Vocabulary
   N - Coin Matching, Matrices, Oral Vocabulary, and Coin Series III

COLLECTION OF DATA:

Because of the nature of the students' handicap, test administration procedures for the GATB and NATB had to be altered. Directions were read to the students by a Test Development Analyst. These directions were then translated into sign language by a North Carolina School for the Deaf instructor. On the Picture-Word portion of the NATB, the sign language interpreter finger spelled the significant word in each statement. On the Oral Vocabulary portion of the NATB, the words were finger spelled and shown on flash cards with two-inch letters. The students were signaled to begin by the interpreter dropping his hand. The sign to stop

was given by flashing the overhead lights. Monitors who were not familiar with sign language communicated with students by writing on their test booklets during the practice exercises.

Testing was conducted in March, 1970. Conditions of testing during the portion of the GATB measuring Clerical Perception made the results of this subtest invalid. These students were retested for Clerical Perception approximately one week later using B-1002B. The scores of the retest were used in this study and were not adjusted for practice effect.

DATA ANALYSIS:

Means and standard deviations were computed for all aptitudes of the GATB and for G, V, and N of the NATB and for the following subgroups of the deaf sample:

1. congenitally deaf
2. noncongenitally deaf
3. male
4. female

The significance of mean differences between the groups were examined by t-tests[3] in the following order:

1. NATB vs GATB for Deaf Sample
2. Deaf vs Non-deaf for GATB
3. Deaf vs Non-deaf for NATB
4. NATB vs GATB for Congenitally Deaf Sample
5. NATB vs GATB for Noncongenitally Deaf Sample
6. Congenitally Deaf vs Noncongenitally Deaf Sample for GATB
7. Congenitally Deaf vs Noncongenitally Deaf Sample for NATB
8. Male Sample vs Female Sample for GATB
9. Male Sample vs Female Sample for NATB

RESULTS:

Table I shows the means, standard deviations, Pearson Product-Moment Correlations, and t-ratios for Aptitudes G, V, and N of the NATB as compared to the same aptitudes as measured by the GATB for the sample of deaf high school students. The mean scores are significantly higher on Aptitudes G, V, and N of the GATB than on the NATB.

TABLE I
Means, Standard Deviations, Pearson Product-Moment Correlations, and t-ratios of Aptitudes G, V, and N of the NATB and GATB for Deaf High School Students

		NATB		GATB			
Aptitude	N	M	SD	M	SD	r	t
G	59	75.6	15.1	85.1	15.4	.928	-12.488**
V	59	64.9	12.0	82.7	11.4	.798	-18.290**
N	59	86.3	18.4	90.7	16.4	.846	- 3.446**

**.01 sig. level

In Table II the mean aptitude scores of the deaf sample are compared to a large sample of non-deaf high school students from North Carolina. The non-deaf sample scored significantly higher than the deaf sample on Aptitudes G, V, and F. The deaf sample scored significantly higher on Aptitudes S, P, Q, and M.

TABLE II
Means, Standard Deviations, and t-ratios of GATB Aptitudes for Deaf Sample and Non-deaf Sample

GATB	Non-deaf Sample			Deaf Sample			
Aptitude	N	M	SD	N	M	SD	t
G	533	91.5	14.4	59	85.1	15.4	3.072**
V	540	90.6	12.2	59	82.7	11.4	5.017**
N	534	94.5	15.5	59	90.7	16.4	1.660
S	539	93.8	18.3	59	101.1	20.3	-2.670**
P	534	101.8	17.3	59	111.1	23.0	-3.026**
Q	540	103.9	13.2	58	117.7	21.4	-4.802**
K	531	102.9	16.3	59	105.6	18.6	-1.072
F	538	92.5	18.3	58	83.6	24.1	2.716**
M	540	102.2	17.9	58	117.7	23.2	-4.918**

**.01 sig. level

Table III shows the means, standard deviations, and t-ratios of NATB aptitudes for deaf high school students and non-deaf disadvantaged high school students. The non-deaf sample scored significantly higher than the deaf sample on Aptitudes G, V, and N of the NATB.

TABLE III
Means, Standard Deviations, and t-ratios of NATB Aptitudes for Deaf High School Students and Non-deaf Disadvantaged High School Students

NATB	Non-deaf Sample			Deaf Sample			
Aptitude	N	M	SD	N	M	SD	t
G	341	94.7	17.8	59	75.6	15.1	8.76**
V	341	92.4	16.0	59	64.9	12.0	15.45**
N	341	102.9	15.6	59	86.3	18.4	6.56**

**.01 sig. level

Table IV shows the means, standard deviations, Pearson Product-Moment Correlations, and t-ratios of Aptitudes G, V, and N of the NATB and GATB for the sample of congenitally deaf high school students. The sample scored significantly higher on the GATB than the NATB on Aptitudes G and V. The difference for Aptitude N is not significant.

TABLE IV
Means, Standard Deviations, Pearson Product-Moment Correlations and t-ratios of Aptitudes G, V, and N of the NATB and GATB for Congenitally Deaf High School Students

		NATB		GATB			
Aptitude	N	M	SD	M	SD	r	t
G	35	74.3	15.7	83.2	15.6	.934	- 9.258**
V	35	64.1	12.1	81.4	11.9	.839	-15.043**
N	35	83.4	17.8	86.5	17.2	.870	- 2.041

**.01 sign. level

Table V shows the means, standard deviations, Pearson Product-Moment Correlations, and t-ratios of Aptitudes G, V, and N of the NATB and GATB for the sample of non-congenitally deaf high school students. The sample scored significantly higher on the GATB than the NATB.

TABLE V
Means, Standard Deviations, Pearson Product-Moment Correlations and t-ratios of Aptitudes G, V, and N of the NATB and GATB for Noncongenitally Deaf High School Students

		NATB		GATB			
Aptitude	N	M	SD	M	SD	r	t
G	24	77.5	14.0	87.8	14.7	.917	- 8.485**
V	24	66.2	11.9	84.8	10.3	.728	-10.946**
N	24	90.6	18.3	97.0	13.0	.820	- 2.910**

**.01 sign. level

Table VI shows the means, standard deviations, and t-ratios of GATB scores for the congenitally deaf sample and the noncongenitally deaf sample. Although the non-congenitally deaf scored higher than the congenitally deaf on all nine aptitudes, the only significant difference is for aptitude N.

TABLE VI
Means, Standard Deviations, and t-ratios of GATB Aptitude Scores for Congenitally Deaf and Noncongenitally Deaf High School Students

GATB	Congenital Sample			Noncongenital Sample			
Aptitude	N	M	SD	N	M	SD	t
G	35	83.2	15.6	24	87.8	14.7	-1.129
V	35	81.4	11.9	24	84.8	10.3	-1.162
N	35	86.5	17.2	24	97.0	13.0	-2.664**
S	35	100.5	19.1	24	102.0	21.8	- .265
P	35	109.8	24.0	24	113.0	21.4	- .532
Q	35	115.7	24.1	23	120.7	16.1	- .955
K	35	103.0	19.8	24	109.4	15.9	-1.360
F	34	80.2	26.7	24	88.5	18.8	-1.401
M	34	115.0	23.9	24	121.5	21.7	-1.083

**.01 sig. level

Table VII shows the means, standard deviations, and t-ratios of NATB aptitude scores for the congenitally deaf and noncongenitally deaf high school students. Although the noncongenitally deaf high school students scored higher than the congenitally deaf students on all aptitudes, the differences were not significant.

TABLE VII
Means, Standard Deviations, and t-ratios of NATB Aptitude Scores for Congenitally Deaf and Noncongenitally Deaf High School Students

NATB Aptitude	Congenital Sample			Noncongenital Sample			t
	N	M	SD	N	M	SD	
G	35	74.3	15.7	24	77.5	14.0	- .828
V	35	64.1	12.1	24	66.2	11.9	- .679
N	35	83.4	17.8	24	90.6	18.3	- 1.507

Table VIII shows the means, standard deviations, and t-ratios of GATB scores for males and females of the deaf high school sample. The males scored higher than the females on Aptitude S. The females scored higher than the males on all other aptitudes. However, Aptitudes P, Q, and K are the only ones with significant differences.

TABLE VIII
Means, Standard Deviations, and t-ratios for Males and Females of Deaf Sample on GATB Aptitudes

GATB Aptitudes	Males			Females			t
	N	M	SD	N	M	SD	
G	31	83.9	18.0	28	86.3	12.6	- .595
V	31	80.1	11.8	28	85.7	10.5	- 1.916
N	31	88.6	18.8	28	93.1	13.6	- 1.041
S	31	103.5	21.1	28	98.5	19.7	.944
P	31	105.3	24.6	28	117.5	20.2	- 2.094*
Q	31	112.3	21.7	27	123.9	20.1	- 2.110*
K	31	99.2	19.0	28	112.8	16.0	- 2.984**
F	30	77.7	23.6	28	90.0	23.9	- 1.985
M	30	115.0	23.1	28	120.6	23.8	- .908

**.01 sig. level
*.05 sig. level

Table IX shows the means, standard deviations of Aptitudes G, V, and N of the NATB for the male and female samples of deaf high school students. The females scored slightly higher than the males on all aptitudes but the differences are not significant.

TABLE IX
Means, Standard Deviations, and t-ratios for Males and Females of Deaf Sample on NATB Aptitudes

NATB Aptitude	Males			Females			t
	N	M	SD	N	M	SD	
G	31	74.2	16.4	28	77.2	14.0	- .746
V	31	63.1	12.6	28	67.0	11.6	- 1.231
N	31	84.9	19.4	28	87.9	17.7	- .613

DISCUSSION:

In comparing Aptitudes G, V, and N of the GATB to the same aptitudes of the NATB for the deaf sample, they scored higher on the tests of the GATB than those of the NATB. The t-tests computed indicate differences for all three aptitudes at the .01 level of significance. (See Table I) The standard deviations were all low and since only one and two point differences existed, no F-tests were computed.

The means and standard deviations of all nine GATB aptitudes of the deaf sample were compared to a sample of non-deaf high school juniors and seniors in Table II. The means for the non-deaf sample are significantly higher on Aptitudes G, V, and F. However, the deaf students scored significantly higher on Aptitudes S, P, Q, and M. The deaf students were told prior to testing that this was a special project in which they were participating while the non-deaf sample was not. This could have affected the results from a motivational standpoint. The tests to measure Aptitude F were very difficult to administer to deaf examinees due to the attention required of the subject and the differences found could be attributed partially to this factor. However, in previous research there seems to be no evidence that the scores on F are significantly lower for deaf examinees and the difference found in this study could be attributed to chance.

In Table III means and standard deviations for Aptitudes G, V, and N as measured by the NATB for the deaf sample are compared to those of the non-deaf disadvantaged high school sample used in the validation study of the NATB. The t-tests computed show that the disadvantaged group scored significantly higher than the deaf group on all three of the aptitudes. This indicates that the NATB may be a better measure of G, V, and N for the non-deaf disadvantaged for which it was designed, but not for the deaf population. This could be attributable to achievement levels as well as language development of the deaf. "In interpreting results of achievement tests with deaf people, it is important to keep in mind that only about 5% of graduates from day and residential schools for the deaf attain a 10th grade level in educational achievement, 41% seventh or eighth grade, 27% fifth or sixth grade, and approximately 30% are fourth grade or below."[4]

Tables IV, V, VI, and VII show comparisons of congenitally deaf and noncongenitally deaf subsamples of the deaf sample. Due to various factors such as incomplete records and the ages of students at the onset of deafness, it was necessary to define noncongenital deafness as occurring any time after birth. Further research is needed in this area, with noncongenital deafness defined as occurring 30 to 36 months after birth. According to psychologists working closely with the deaf, this is the minimum time required for a deaf individual to acquire speech patterns that are retained. Although it is known that the deafness of all students included in our noncongenitally deaf subsample occurred sometime after birth it was impossible to determine at exactly what time after birth the deafness occurred. In light of these facts, the results of these tables should be interpreted with caution.

In comparing males to females of the deaf sample, the mean scores for all aptitudes of the GATB are in agreement with previous studies of non-deaf samples.[5] The males scored slightly higher than the females on Aptitude S. The females scored slightly higher on all other aptitudes. The only significant difference occurred on Aptitude K, where the females scored higher than the males at the .01 significance level. (See Table VIII)

The females scored slightly higher than the males on Aptitudes G, V, and N of the NATB. However, none of these differences are significant. Although research of sex differences for aptitudes of the NATB has not been completed, it is assumed that the differences are similar to the sex differences found in research involving the GATB. The scores of the deaf sample indicate that this is the case. (See Table IX)

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